U.S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

SCIENTIFIC NAME: *Cyanea calycina*

COMMON NAME: Haha

LEAD REGION: Region 1

INFORMATION CURRENT AS OF: July 2005

STATUS/ACTION:

___ Species assessment - determined species did not meet the definition of endangered or threatened under the Act and, therefore, was not elevated to Candidate status

___ New candidate

_X__ Continuing candidate

___ Non-petitioned

_X__ Petitioned - Date petition received: May 11, 2004

__ 90-day positive - FR date:

_X_ 12-month warranted but precluded - FR date: May 11, 2005

_N_ Did the petition request a reclassification of a listed species?

FOR PETITIONED CANDIDATE SPECIES:

a. Is listing warranted (if yes, see summary of threats below)? yes

b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? yes

c. If the answer to a. and b. is "yes", provide an explanation of why the action is precluded. We find that the immediate issuance of a proposed rule and timely promulgation of a final rule for this species has been, for the preceding 12 months, and continues to be, precluded by higher priority listing actions. During the past 12 months, most of our national listing budget has been consumed by work on various listing actions to comply with court orders and court-approved settlement agreements, meeting statutory deadlines for petition findings or listing determinations, emergency listing evaluations and determinations and essential litigation-related, administrative, and program management tasks. We will continue to monitor the status of this species as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures. For information on listing actions taken over the past 12 months, see the discussion of "Progress on Revising the Lists," in the current CNOR which can be viewed on our Internet website (http://endangered.fws.gov).

___ Listing priority change

Former LP: ___

New LP: ___

Date when the species first became a Candidate (as currently defined): 1999

___ Candidate removal: Former LP: __

___ A – Taxon is more abundant or widespread than previously believed or not subject to

the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.

___U – Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.

___ F – Range is no longer a U.S. territory.

___ I – Insufficient information exists on biological vulnerability and threats to support listing.

___ M – Taxon mistakenly included in past notice of review.

___ N – Taxon does not meet the Act's definition of "species."

___ X – Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Flowering plants, Campanulaceae (Bellflower family)

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Hawaii, island of Oahu

CURRENT STATES/ COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE: Hawaii, island of Oahu

LAND OWNERSHIP: This species is known to occur on lands owned by the State of Hawaii, Federal government, and private citizens.

LEAD REGION CONTACT: Paul Phifer, 503-872-2823, paul_phifer@fws.gov

LEAD FIELD OFFICE CONTACT: Pacific Islands Fish and Wildlife Office, Christa Russell, 808-792-9400, christa_russell@fws.gov

BIOLOGICAL INFORMATION:

Species Description *Cyanea calcyina* is an unbranched shrub, with woody stems 1 to 3 meters (m) (3 to 10 feet (ft)) long, becoming nearly smooth with age. Leaves are elliptic or oblanceolate, with blades 15 to 60 centimeters (cm) (6 to 24 inches (in)) long and 5.5 to 14 cm (2.2 to 5.5 in) wide, upper surface glabrous, and lower surface densely pubescent or rarely glabrous. Inflorescences are 4 to 16 flowered, with peduncles 20 to 100 millimeters (mm) (0.8 to 4.0 in) long. The calyx lobes are oblong to ovate and 4 to 10 mm (0.2 to 0.4 in) long. The corolla is pale to dark magenta and the hypanthium is pubescent. Berries are obovoid and 16 to 20 mm (0.6 to 0.8 in) long (Lammers 1999).

Taxonomy *Cyanea calycina* was originally described by Lammers as *Rollandia lanceolata* ssp. *calycina*. All species of *Rollandia* have been moved to *Cyanea*, without a change in the taxonomic entity. Originally treated as a subspecies of *Cyanea lanceolata*, this entity has been elevated to full species status (Lammers 1998; Lammers *et al*. 1993). This species is recognized as a distinct taxon in Lammers (1999) and Wagner and Herbst (2003), the most recently accepted

Hawaiian plant taxonomy.

Habitat *Cyanea calcyina* is found in *Metrosideros-Dicranopteris* montane wet forest and wet gulches and streambanks with a substrate of talus and brown soil with leaf litter. It occurs with the following associated native species: *Acacia koa*, *Antidesma* sp., *Astelia menziesiana*, *Broussaisia arguta*, *Chamaesyce* sp., *Cheirodendrom platyphylla*, *C. trigynum*, *Cibotium* sp., *Clermontia kakeana*, *Coprosma longifolia*, *Cyrtandra* sp., *Dianella sandwicensis*, *Diplazium sandwichianum*, *Dodonaea viscosa*, *Dubautia* sp., *Freycinetia arborea*, *Hedyotis schlectendahliana*, *Hedyotis terminalis*, *Ilex anomala*, *Labordia kaalae*, *Lysimachia hillebrandii*, *Melicope christophersenii*, *M. honoluluensis*, *M. peduncularis*, *Myrsine lessertiana*, *Neraudia melastomifolia*, *Peperomia macraeana*, *Perrottetia sandwicensis*, *Phyllostegia grandiflora*, *Pisonia* sp., *Psychotria* sp., *Scaevola gaudichaudiana*, *Schiedea* sp., and *Trematolobelia* sp., at elevations between 268 to 1,036 m (880 to 3,400 ft) (Ken Wood, National Tropical Botanical Garden, pers. comm. 1999; Hawaii Natural Heritage Program Database 2004).

Historical and Current Range/Current Status *Cyanea calycina* is known from about 20 populations totaling 200 or more individuals on the island of Oahu (Marie M. Bruegmann, U.S. Fish and Wildlife Service (Service), pers. comm. 1995; Joel Lau, Hawaii Natural Heritage Program, pers. comm. 1996; John Obata, amateur botanist and Steve Perlman, National Tropical Botanical Garden, pers. comms. 1996; Kapua Kawelo, U.S. Army, pers. comm. 2005).

THREATS:

A. The present or threatened destruction, modification, or curtailment of its habitat or range. This species is threatened by feral pigs (*Sus scrofa*) and goats (*Capra hircus*) that adversely modify habitat (J. Lau, pers. comm. 1996, J. Obata and S. Perlman, pers. comm. 1996). As early as 1778, European explorers introduced livestock, which became feral, increased in number and range, and caused significant changes to the natural environment of Hawaii. Past and present activities of introduced alien mammals are the primary factor altering and degrading vegetation and habitats on Oahu. The pig is originally native to Europe, northern Africa, Asia Minor, and Asia. European pigs, introduced to Hawaii by Captain James Cook in 1778, became feral and invaded forested areas, especially wet and mesic forests and dry areas at high elevations. They are currently present on Oahu and four other islands, and inhabit rain forests and grasslands. While rooting in the ground in search of the invertebrates and plant material they eat, feral pigs disturb and destroy vegetative cover, trample plants and seedlings, and threaten forest regeneration by damaging seeds and seedlings. They disturb soil and cause erosion, especially on slopes. Alien plant seeds are dispersed on their hooves and coats as well as through their digestive tracts, and the disturbed soil is fertilized by their feces, helping these plants to establish. Pigs are a major vector in the spread of many introduced plant species and have been seen in the habitat where *Cyanea calycina* is found (J. Lau, pers. comm. 1996, J. Obata and S. Perlman, pers. comm. 1996; Smith 1985; Stone 1985; Medeiros *et al*. 1986; Scott *et al*. 1986; Tomich 1986; Cuddihy and Stone 1990; Wagner *et al*. 1999a). Pig exclusion fences will be constructed in the coming year to protect at least one (Helemano area) of the 20 known populations of this species; however, without continued monitoring and maintenance of those fences, pigs from surrounding areas can easily access fenced areas. In addition, the remaining,

unfenced individuals of this taxon are still impacted by this threat.

The goat, a species originally native to the Middle East and India, was successfully introduced to the Hawaiian Islands in 1792. Currently, populations exist on Oahu, Kauai, Maui, and Hawaii. Goats browse on introduced grasses and native plants, especially in drier and more open ecosystems. Direct predation by goats has not been documented for *Cyanea calycina* but they are reported to eat native vegetation, trample roots and seedlings, cause erosion, and promote the invasion of alien plants. They are able to forage in extremely rugged terrain and have a high reproductive capacity (Clarke and Cuddihy 1980; van Riper and van Riper 1982; Scott *et al*. 1986; Tomich 1986; Culliney 1988; Cuddihy and Stone 1990). No control measures, such as exclusionary fences, have been implemented to date to address threats from goats. Goats are able to jump fences constructed to exclude pigs.

B. Overutilization for commercial, recreational, scientific, or educational purposes.
None known.

C. Disease or predation.
Direct predation by pigs to individuals of this species has been documented (J. Lau, pers. comm. 1996; J. Obata and S. Perlman, pers. comms. 1996). Pig exclusion fences will be constructed in the coming year to protect at least one of the 20 known populations of *Cyanea calycina*; however, without continued monitoring and maintenance of those fences, pigs from surrounding areas can easily access fenced areas. In addition, the remaining, unfenced individuals of this taxon are still impacted by this threat.

Rats and slugs are a threat to other members of this genus, and therefore are a potential threat to *Cyanea calycina*. Of the four species of rodents that have been introduced to the Hawaiian Islands, the species with the greatest impact on the native flora and fauna is probably *Rattus rattus* (black or roof rat), which now occurs on all the main Hawaiian Islands. Black rats, and to a lesser extent *Mus musculus* (house mouse), *R. exulans* (Polynesian rat), and *R. norvegicus* (Norway rat), eat the fruits of some native plants, especially those with large, fleshy fruits. Many native Hawaiian plants produce fruit over an extended period of time, thus producing a prolonged food supply for rodent populations. Black rats strip bark from some native plants, and eat the fleshy stems and fruits of plants in the bellflower and African violet families (Tomich 1986; Cuddihy and Stone 1990). Rat damage to the stems of species of *Cyanea* has been reported in the wet forests of Kauai (Loyal Mehrhoff, Service, pers comm. 1994; S. Perlman, pers. comm. 1994).

Little is known about the predation of certain rare Hawaiian plants by slugs. Indiscriminate predation by slugs on plant parts of the related *Cyanea remyi* has been observed by field botanists (L. Mehrhoff, pers. comm. 1994; S. Perlman, pers. comm. 1994). The effect of slugs on the decline of this and related species is unclear, although slugs may pose a threat by feeding on the stems and fruit, thereby, reducing the vigor of the plants and limiting regeneration. Outplanted seedlings of the closely related genus *Clermontia* have been completely removed by slugs (Alvin Yoshinaga, University of Hawaii's Lyon Arboretm, pers. comm. 1995).

Currently, there are no control measures being implemented to address these threats.

D. The inadequacy of existing regulatory mechanisms.
Pigs and goats are managed in Hawaii as game animals, but many herds populate inaccessible areas where hunting is difficult, if not impossible, and therefore has little effect on their numbers (Hawaii Heritage Program 1990). Pig and goat hunting is allowed on all islands either year-round or during certain months, depending on the area (Hawaii Department of Land and Natural Resources n.d.-a, n.d.-b, n.d.-c). However, public hunting does not adequately control the number of feral pigs and goats to eliminate these threats to native plant species. Pig exclusion fences will be constructed in the coming year to protect at least one of the 20 known populations of *Cyanea calycina*; however, without continued monitoring and maintenance of those fences, pigs from surrounding areas can easily access fenced areas. No known control measures have been implemented to date to address threats from feral goats. Goats are able to jump over pig exclusion fences. The remaining, unfenced individuals of *Cyanea calycina* are still impacted by both feral pigs and goats.

E. Other natural or manmade factors affecting its continued existence.
Alien plant species are a major threat to this species (J. Lau, pers. comm. 1996; J. Obata and S. Perlman, pers. comms. 1996). Although the exact pest species that threaten this plant have not been identified, alien pest plants are found throughout the areas where this species occurs on Oahu.

The original native flora of Hawaii consisted of about 1,400 species, nearly 90 percent of which were endemic. Of the total native and naturalized Hawaiian flora of 1,817 taxa, 47 percent were introduced from other parts of the world, and nearly 100 species have become pests (Smith 1985; Wagner *et al*. 1999a). Several studies (Cuddihy and Stone 1990; Wood and Perlman 1997; Robichaux *et al*. 1998) indicate nonnative plant species may outcompete native plants similar to *Cyanea calycina*. Competition may be for space, light, water, or nutrients, or there may be a chemical inhibition of other plants (Smith 1985; Cuddihy and Stone 1990). In addition, nonnative pest plants found in habitat similar to that of this species have been shown to make the habitat less suitable for native species (Smathers and Gardner 1978; Smith 1985; Loope and Medeiros 1992; Medeiros *et al.* 1992; Ellshoff *et al.* 1995; Meyer and Florence 1996; Medeiros *et al.* 1997; Loope *et al*. 2004). In particular, alien pest plant species modify habitat by modifying availability of light, altering soil-water regimes, modifying nutrient cycling, or altering fire characteristics of native plant communities (Smith 1985; Cuddihy and Stone 1990; Vitousek *et al*. 1987). Because of demonstrated habitat modification and resource competition by nonnative plant species in habitat similar to *Cyanea calycina*, the Service believes nonnative plant species are a threat to *Cyanea calycina*.

No known control measures have been taken to date to address this threat.

CONSERVATION MEASURES PLANNED OR IMPLEMENTED
The Koolau Watershed Partnership was provided funding from the Service in 2005 to fence and remove ungulates from the Helemano area of Oahu, which will benefit this species once these management actions are implemented (Koolau Mountains Watershed Partnership 2005).

SUMMARY OF THREATS:
The major threats to this taxon are pigs, goats, and nonnative plant species, which are believed to be a major cause of the decline of this species throughout its range. Rats and slugs are potential threats. Feral pigs will soon be fenced out of at least one of the 20 populations of *Cyanea calycina*, but the fences must be continually maintained to prevent incursion. No control measures, such as exclusionary fences, have been implemented to date to address threats from goats. Goats are able to jump fences constructed to exclude pigs. Nonnative plants currently are not being controlled and no control measures are being implemented to address potential threats from rats and slugs. The species as a whole is still impacted by these threats and will require long-term monitoring and management to maintain threat free areas.

LISTING PRIORITY:

THREAT			
Magnitude	Immediacy	Taxonomy	Priority
High	**Imminent**	Monotypic genus	1
		Species	**2***
		Subspecies/population	3
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/population	6
Moderate to Low	Imminent	Monotypic genus	7
		Species	8
		Subspecies/population	9
	Non-imminent	Monotypic genus	10
		Species	11
		Subspecies/population	12

Rationale for listing priority number:
Magnitude:
This species is highly threatened by pigs and goats that degrade and destroy habitat, and by nonnative plants that outcompete and displace it. Potential threats to this species include rats and slugs that may directly prey upon individuals of *Cyanea calycina*. These threats to the montane wet forest habitat of *C. calycina* and to individuals of this species occur throughout its range, and are expected to continue or increase without their control or eradication. Feral pigs will soon be fenced out of at least one of the 20 populations of *Cyanea calycina*, but the fences must be continually maintained to prevent incursion. No control measures, such as exclusionary fences, have been implemented to date to address threats from goats. Goats are able to jump fences constructed to exclude pigs. Nonnative plants currently are not being controlled and no control measures are being implemented to address potential threats from rats and slugs.

Imminence:
Threats to *Cyanea calycina* from feral pigs and goats, and nonnative plants are imminent because they are ongoing. Construction of the Helemano area pig-exclusion fence has not begun.

Yes Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed?

Is Emergency Listing Warranted? No. *Cyanea calycina* is currently known from about 20 populations totaling 200 or more individuals. It is threatened by habitat destruction by feral pigs and goats, and by competition with nonnative plants. The species does not appear to be appropriate for emergency listing at this time because the immediacy of the threats is not so great as to imperil a significant proportion of the taxon within the time frame of the routine listing process. One population of *C. calycina* will be protected from feral pigs by fences constructed by the Koolau Watershed Management Partnerships and funded in part by the Service. If it becomes apparent that the routine listing process is not sufficient to prevent large losses that may result in this species' extinction, then the emergency rule process for this species will be initiated. We will continue to monitor the status of *C. calycina* as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures.

DESCRIPTION OF MONITORING:
Much of the information in this form is based on the results of a meeting of 20 botanical experts held by the Center for Plant Conservation in December of 1995, and was updated by personal communication with Joel Lau , Hawaii Natural Heritage Program, in 1994 and 1995; John Obata, highly respected amateur botanist, and Steve Perlman of National Tropical Botanical Garden in 1996; Ken Wood, National Tropical Botanical Garden, in 1996; Loyal Mehrhoff, Service, in 1994; and Alvin Yoshinaga, Lyon Arboretum, in 1995. We have incorporated additional information on this species from our files and the most recent supplement to the *Manual of the Flowering Plants of Hawaii* (Wagner and Herbst 2003). In 2004 the Pacific Islands office contacted the following species experts: Bob Hobdy, retired from Hawaii Division of Forestry and Wildlife; Joel Lau, Hawaii Natural Heritage Program; Art Medeiros, U.S.G.S. Biological Resources Discipline; Hank Oppenheimer, resource manager for Maui Land and Pineapple Company; and Steve Perlman and Ken Wood, National Tropical Botanical Garden. No new information was provided by these individuals and they were not able to clarify the current status of these plants in 2004. In 2005 we contacted the species experts listed below and confirmation of the status of *Cyanea calycina* was provided by Kapua Kawelo, U.S. Army.

The Hawaii Natural Heritage Program identified this species as critically imperiled (HINHP Database 2004). Based on the International Union for Conservation of Nature and Natural Resources Red Plant Data Book rarity categories, this species is recognized as Rare (at risk of extinction) by Wagner *et al.* (1999b).

One species expert provided new information confirming the status of the species this year and the results are included in this assessment.

COORDINATION WITH STATES:
In October 2004 we provided the Hawaii Division of Forestry and Wildlife with copies of our most recent candidate assessments for their review and comment. Vickie Caraway, the State botanist, reviewed the information for this species and provided no additional information or corrections (V. Caraway, pers. comm. 2005).

LITERATURE CITED
List all experts contacted:

Name	Date	Place of Employment
1. Joel Lau	June 28, 2005	Hawaii Natural Heritage Program
2. Art Medeiros	June 28, 2005	U.S.G.S. Biological Resources Discipline
3. Jim Jacobi	June 28, 2005	U.S.G.S. Biological Resources Discipline
4. Rick Warshauer	June 28, 2005	U.S.G.S. Biological Resources Discipline
5. Hank Oppenheimer	June 28, 2005	Maui Land and Pineapple Company
6. Kapua Kawelo*	June 28, 2005	U.S. Army
7. Dave Lorence	June 28, 2005	National Tropical Botanical Garden
8. Steve Perlman	March 29, 2005	National Tropical Botanical Garden
9. Ken Wood	June 28, 2005	National Tropical Botanical Garden
10. Marie Bruegmann	July 13, 2005	U.S. Fish and Wildlife Service
11. Vickie Caraway	June 14, 2005	Hawaii Division of Forestry and Wildlife

*Provided new information on this taxon in 2005

List all databases searched:

Name	Date
1. Hawaii Natural Heritage Program	2004

Other resources utilized:

Center for Biological Diversity, Dr. Jane Goodall, Dr. E.O. Wilson, Dr. Paul Ehrlich, Dr. John Terborgh, Dr. Niles Eldridge, Dr. Thomas Eisner, Dr. Robert Hass, Barbara Kingsolver, Charles Bowden, Martin Sheen, the Xerces Society, and the Biodiversity Conservation Alliance. 2004. Hawaiian Plants: petitions to list as federally endangered species. May 4, 2004.

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Hawaii, Department of Land and Natural Resources. N.d.-b. Summary of Title 13, Chapter 123, Game mammal hunting rules, island of Molokai. Division of Forestry and Wildlife, Honolulu. 2 pp.
Hawaii, Department of Land and Natural Resources. N.d.-c. Summary of Title 13, Chapter 123, Game mammal hunting rules, island of Maui. Division of Forestry and Wildlife, Honolulu. 2 pp.
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Lammers, T. G., T. J. Givnish, and K. J. Sytsma. 1993. Merger of the endemic Hawaiian genera *Cyanea* and *Rollandia* (Campanulaceae: Lobelioideae). Novon 3: 437-441.
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Loope, L., F. Starr and K. Starr. 2004. Management and research for protecting endangered Hawaiian plant species from displacement by invasive plants on Maui, Hawaii. Weed Technology 18: 1472-1474.
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Medeiros, A.C., L.L. Loope, T. Flynn, S.J. Anderson, L.W. Cuddihy, and K.A. Wilson. 1992. Notes on the status of an invasive Australian tree fern (*Cyathea cooperi*) in Hawaiian rain forests. American Fern Journal 82: 27-33.
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APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes to the candidate list, including listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all 12-month petition findings, additions of species to the candidate list, removal of candidate species, and listing priority changes.

Approve: Acting _____ 11/16/05
Regional Director, Fish and Wildlife Service Date

_____

Concur: _____ August 23, 2006
Director, Fish and Wildlife Service Date

Do not concur: _____ _____
Director, Fish and Wildlife Service Date

Date of annual review: September 19, 2005
Conducted by: Marie M. Bruegmann, Pacific Islands FWO
Plant Recovery Coordinator

Comments:
PIFWO Review

Reviewed by: Christa Russell Date: September 20, 2005
Plant Conservation Program Leader

Gina Shultz Date: October 17, 2005
Assistant Field Supervisor,
Endangered Species

Patrick Leonard Date: October 17, 2005
Field Supervisor